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A REMARKABLE PREDACIOUS CETONIID, *SPILOPHORUS MACULATUS* (GORY & PERCHERON), FROM SOUTHERN INDIA (COLEOPTERA: SCARABAEIDAE)

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ABSTRACT

A peculiar cetoniid beetle, *Spilophorus maculatus* (Gory & Percheron), belonging to the tribe Cremastocheilini, is reported feeding in nature on the nymphs of a membracid bug, *Oxyrhachis tarandus* (Fabr.), near Bangalore in southern India. This is the first record of a cetoniid feeding on an insect other than an ant. A redescription of the cetoniid is included together with a short summary of the feeding habits of adult Scarabaeidae.

The large beetle family Scarabaeidae, of which the Cetoniinae is thought to be only a subfamily (Mikšić 1971), is almost entirely phytophagous, the larvae living in soil and feeding on plant roots and decaying matter, the adults attacking foliage, flowers, and fruit. Adult cetoniids are usually brightly coloured, fly by day, and feed on flowers of a variety of plants. According to Imms (1963) their " . . . mouthparts are adapted for dealing with soft or liquid food and the labrum is membraneous and concealed; the mandibles, with few exceptions, are thin and incapable of biting, and the maxillae are invested with long hairs."

Writing about the only known fully carnivorous cetoniid, Wilson (1971) stated that certain North American species of the genus *Cremastocheilus* were recently discovered by Dr. Mont A. Cazier and his colleagues to be obligate predators of the larvae of ants of the genus *Myrmecocystus;* the ants treated the beetles sometimes as synechthrans and sometimes as symphiles but they mostly had the status of synoeketes.

Adult cetoniids, apart from their well-known habit of feeding on plant juices, pollen and nectar of flowers, have also been found to be associated with ants and termites, as well as in nests of passerine birds. Besides the above record of species of *Cremastocheilus* preying on ant larvae, no other cetoniid is known to feed on any other insect.
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In October 1970, I found a cetoniid, *Spilophorus maculatus* (Gory and Percheron), feeding on nymphs of a tree-hopper, *Oxyrhachis tarandus* (Fabricius) (Homoptera: Membracidae), attacking *Acacia concinna* DC., near Bangalore in southern India. A solitary beetle was noticed near a colony of the membracid on a stem of the tree. On closer observation, I saw it grasp a tree-hopper nymph in its fore legs and commence to chew it slowly and methodically, devouring the posterior end of the nymph first. The movements of the cetoniid were extremely slow and laboured, and the membracid nymphs made no attempt to escape. Large red ants attending the tree-hoppers took no notice of the beetle, and it appeared that its dull black-and-white coloring and sluggish movements assist in concealing its presence from the membracids and their ant attendants. The cetoniid was brought to the laboratory where it was maintained on a diet of nymphs of *O. tarandus* supplemented with diluted honey solution for a month, before it was killed and mounted for study. The beetle was noted, in addition, to feed on the honeydew produced by the tree-hoppers both in nature and in the laboratory. This constitutes the first record of a non-formicid host of a cetoniid. A redescription is provided below since available descriptions are brief and unsatisfactory.

Spilophorus maculatus (Gory and Percheron)
(Fig. 1-4)

Cremastochilus maculatus Gory and Percheron 1833:119, pl. 16, fig. 8, Monogr. Cet.; Westwood 1874:29, Thes. Ent. Oxon.

Spilophorus bangalorensis Kraatz 1899:63, Dt. Ent. Z.

Spilophorus maculatus: Arrow 1910:201, Fauna of British India, Coleoptera, Lamellicornia, pt. 1.

Female: Length 12.4mm., width 7.0mm., height 4.3mm. Shining black above and below, with white opaque markings on dorsal surface as in Fig. 1. On ventral surface, a white patch on lateral portion of metasternum and on antero-lateral parts of abdominal sternites, and small white spots on the antero-lateral corners of sternites 1 to 4. White markings on pygidium as in Fig. 4, and on head as in Fig. 2. Antennae black, mandibles and most of other mouthparts dark reddish-brown. Legs shining black, with a small white spot on base of each tibia within apical emargination of femora. Hairs on legs amber to reddish-yellow.

Head with primary punctures on frontal region close and well impressed, almost circular, these becoming smaller and less impressed toward clypeus. Frons with a narrow lateral extension over eye, with rounded apex. Clypeus emarginate in centre, with a ridge-like callus on its posterior margin, visible as an angulate projection in profile. Mandibles well-developed, fairly stout, almost cylindrical and gently curved inwards, with a rounded apex. Pronotal contours as in Fig. 1, widely emarginate on posterior margin in centre, with posterior angles smooth and blunt; lateral margin slightly angulate in middle. Punctures obsolete on white portions and on the postero-median area, the rest covered sparsely with similar punctures as on head. Scutellum broadly triangular with apex pointed and basal margin arcuate; punctures as on pronotum and absent in centre, most prominent near the angles. Elytral contours as in Fig. 1, slightly depressed behind scutellum with very irregularly placed arrowheadshaped punctures with apices directed toward pronotum. Ventral body surface with less impressed punctures, but more uniformly placed than on elytra. Median part of metasternum devoid of punctures. Punctures on sternites small medially and larger laterally. Mesosternal process short, slightly bulbous, not exceeding bases of coxae, with shining, rounded tip. Abdominal sternites subequal in length. Pygidium (Fig. 4) with sparse, less impressed punctures and a median carina obsolete at tip. Legs (Fig. 3) with punctures as on abdominal sternites, hairs short and sparse; tibia with 2 spines at mid-length on outer side and 3 spines at apex of fore tibia and 5 spines at apex of hind tibia; tarsi 5-segmented with claws simple and pointed with a smaller median denticular process.

Material examined: INDIA: State of Karnataka, Doddagubbi nr. Bangalore, X-1970, K. D. Ghorpade, No. KDG 2706, feeding on nymphs of membracid on *Acacia concinna,* 916 m., Ghorpade (1).

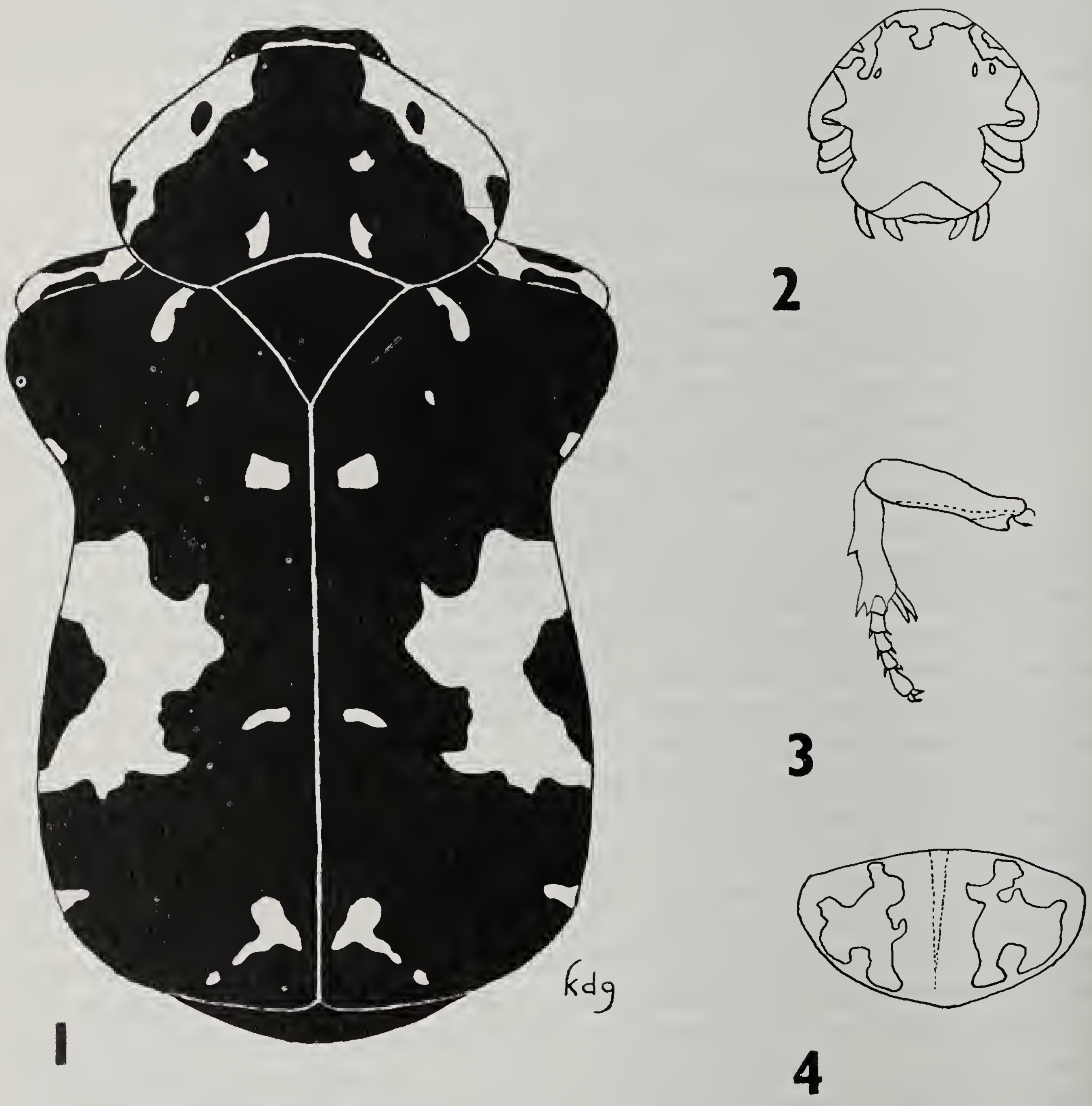

Fig. 1-4: 1) dorsal habitus view of *Spilophorus maculatus* (G. & P.) showing contours and coloration; 2) frontal head view showing contours and outline of markings; 3) lateral view of right hind leg; 4) posterior view of pygidium showing contours and outline of markings.

Distribution: India: Karnataka: Bangalore.

Spilophorus maculatus, originally described from Bangalore and known only from there, belongs to the tribe Cremastocheilini, the members of which " . . . are exceptional in being mostly sombre-colored nocturnal insects, living as larvae and adults in the nests of ants and termites" (Imms 1963). The genus *Spilophorus* Lacordaire occurs in Africa and India, only 2 species having been described from within Indian limits (Arrow 1910). The other species, *S. cretosus* Hope, was found in the nest of a black ant (*Crematogaster* sp.) at Malegaon in Maharashtra by H. Maxwell-Lefroy. In South Africa, a species of this genus is known to live in nests of passerine birds where both adults and larvae feed on nest material and excrement, the black-and-white coloring (in all species of the genus) being a protective assimilation to such an environment (Arrow 1910).

Ritcher (1958), in his review of the biology of the Scarabaeidae, stated that adult Cetoniinae are largely liquid feeders, feeding above ground on plant juices, either sap or the juices of ripening fruit or vegetables. Other species are common on flowers, where they feed on pollen and nectar. Most species of the subfamily are diurnal in habit.

The only known instance of a predacious habit in the subfamily Cetoniinae was reported by Cazier and Statham (1962) and by Cazier and Mortenson (1965), mentioned earlier. Wilson (1971) in his excellent book, **Insect Societies,** stated: "Certain North American species of the scarab genus *Cremastocheilus* . . . were recently discovered . . . to be obligate predators of larvae of the ant genus *Myrmecocystus*–the first recorded case of primarily predatory behaviour within the Scarabaeidae" (p. 390), and " . . . while *Cremastocheilus* has changed from what was almost certainly a herbivorous diet to become the only known fully carnivorous scarabaeid" (p. 402). However, there are stray reports of the predacious habit in other subfamilies of the Scarabaeidae. Ritcher (1958) gave the following examples. In the Scarabaeinae (=Coprinae), *Canthon deplanatus* var. *fastuosus* Harris is predacious on queen ants of *Atta* spp., using the dead body of the queen as a component of the ball in which its larva later develops. *Aphodius porcus* Horn (Aphodiinae) feeds on the eggs of *Geotrupes stercorarius* Linnaeus (Geotrupidae). Larvae of *Trox procerus* Harold and *T. suberosus* Fabricius (Troginae) prey on the eggs of some locusts and grasshoppers and are therefore considered to be of great economic importance. Clausen (1940) mentioned that some dung beetles (Scarabaeinae) indirectly kill dipterous maggots feeding on animal excreta by devouring the dung before the maggots reach maturity.

Numerous genera of the Cetoniinae are associated with ants or termites all over the world, some examples of myrmecophilous genera being *Cremastocheilus, Plagiochilus,* and *Myrmecochilus,* and of termitophilous genera being *Coenochilus* and *Valgus* (Ritcher 1958). This author quotes Wheeler as stating that beetles of the genus *Cremastocheilus* are degenerate symphiles which may have once been of use to the ants but are now persecuted intruders (synechthrans). The larvae of this genus and of certain species of *Euphoria* feed within the vegetative debris of the ant colonies of the genus *Formica.* Species of *Valgus* are found in decaying wood associated with termite colonies, their larvae feeding on the walls of old termite galleries. Wilson (1971:396) listed the genera *Cryptodus* and *Euphoria* as being associated with the ant genera *Camponotus, Formica,* and *Leptomyrmex.*

As examples of termitophilous Scarabaeidae he gave *Afroharoldius, Chaetopisthes, Coenochilus, Corythoderus, Novapus, Ryparus, Termitodius,* and *Termitotrox.*

In the present study, *S. maculatus* was found to be active during the day, contrary to the statement of Imms (1963) that members of the tribe Cremastocheilini are nocturnal. Since species of *Spilophorus* possess fairly well developed mandibles, the newly discovered predacious habit within this genus may actually prove to more or less frequent in it. It is possible, therefore, that more intensive observations on the habits of species of this genus and of others of the tribe Cremastocheilini may reveal more interesting facts regarding their food and feeding habits.

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